High Alert

**propranolol** (proe-pran-oh-lole)

**Trade Names**: Inderal, Inderal LA, InnoPran XL

**Classification**

Therapeutic: antianginals, antiarrhythmics (Class II), antihypertensives, vascular headache suppressants

Pharmacologic: beta blockers

**Pregnancy Category C**

**Indications**

Management of hypertension, angina, arrhythmias, hypertrophic cardiomyopathy, thyrotoxicosis, essential tremors, pheochromocytoma. Also used in the prevention and management of MI, and the prevention of vascular headaches. 

**Use**

Also used to manage alcohol withdrawal, aggressive behavior, antipsychotic-associated akathisia, situational anxiety, and esophageal varices. Post-traumatic stress disorder (PTSD) (ongoing clinical trials at National Institute for Mental Health [NIMH]).

**Action**

Blocks stimulation of beta1 (myocardial) and beta2 (pulmonary, vascular, and uterine)-adrenergic receptor sites.

**Therapeutic Effects**

Decreased heart rate and BP. Suppression of arrhythmias. Prevention of MI.

**Pharmacokinetics**

**Absorption**

Well absorbed but undergoes extensive first-pass hepatic metabolism.

**Distribution**

Moderate CNS penetration. Crosses the placenta; enters breast milk.

**Protein Binding**

93%.

**Metabolism and Excretion**

Almost completely metabolized by the liver (primarily for CYP2D6 isoenzyme) (the CYP2D6 enzyme system exhibits genetic polymorphism; 7% of population may be poor metabolizers and may have significantly higher propranolol concentrations and an increased risk of adverse effects).

**Half-life**

3.5–6 hr.

- CONTRAINDICATIONS
  - Uncompensated HF; Pulmonary edema; Cardiogenic shock; Bradycardia, sick sinus syndrome, or heart block (unless pacemaker present).

- **Use Cautiously**
  - Renal or hepatic impairment; Pulmonary disease (including asthma); Diabetes mellitus (may mask signs of hypoglycemia); Thyrotoxicosis (may mask symptoms); History of severe allergic reactions (may raise intensity of response); Skeletal muscle disease (may exacerbate myopathy); OB: Crosses the placenta and may cause fetal/neonatal bradycardia, hypotension, hypoglycemia, or respiratory depression. May also increase blood supply to the placenta, increase the risk for premature birth or fetal death, and cause intrauterine growth retardation. May raise risk of cardiac and pulmonary complications in the infant during the neonatal time frame.

- **Dose**
  - Appropriate in breast milk; use formula if propranolol must be taken.

**Adverse Reactions/Side Effects**

**CNS:** Fatigue, weakness, anxiety, dizziness, dry mouth, insomnia, memory loss, mental depression, mental status changes, nightmares, tightness. 

**EENT:** Blurred vision, dry eyes, nasal stuffiness.

**Resp:** Bronchospasm, wheezing.

**CV:** Bradycardia, BRADYCARDIA, HF, PULMONARY EDEMA, orthostatic hypotension, peripheral vasoconstriction.

**GI:** Constipation, diarrhea, nausea.

**GU:** Erectile dysfunction, libido.

**Derm:** ERYTHEMA MULTIFORME, EXFOLIATIVE DERMATITIS, STEVENS-JOHNSON SYNDROME, TOXIC EPIDERMAL NECROLYSIS, itching, rash.

**Endo:** Hyperglycemia, hypoglycemia (in children).

**MS:** Arthralgia, back pain, muscle cramps, myopathy.

**Neuro:** Paresthesia.

**Misc:** Eosinophilia, drug-induced lupus syndrome.

**Interactions**

**Drug-Drug:** General anesthesia, IV phenytoin, and verapamil may cause additive myocardial depression. Additive bradycardia may occur with digoxin.

**Additive Effects**

**TIME/ACTION PROFILE (cardiovascular effects)**

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>immediate</td>
<td>1 min</td>
<td>4–6 hr</td>
</tr>
<tr>
<td>PO</td>
<td>0.5–2 hr</td>
<td>3–6 hr</td>
<td>6–12 hr</td>
</tr>
</tbody>
</table>

**Contraindications/Precautions**

**Contraindicated in**

Uncompensated HF; Pulmonary edema; Cardiogenic shock; Bradycardia, sick sinus syndrome, or heart block (unless pacemaker present).

**Use Cautiously in**

Renal or hepatic impairment; Pulmonary disease (including asthma); Diabetes mellitus (may mask signs of hypoglycemia); Thyrotoxicosis (may mask symptoms); History of severe allergic reactions (may raise intensity of response); Skeletal muscle disease (may exacerbate myopathy); OB: Crosses the placenta and may cause fetal/neonatal bradycardia, hypotension, hypoglycemia, or respiratory depression. May also increase blood supply to the placenta, increase the risk for premature birth or fetal death, and cause intrauterine growth retardation. May raise risk of cardiac and pulmonary complications in the infant during the neonatal time frame.
Hypertension may occur with other antihypertensives, acute ingestion of alcohol, or nitrites. Levels may be ↓ with chronic alcohol use. Concurrent use with amphetamines, cocaine, cephedrine, ethers, metaproterenol, phenylpropanolamine, or pseudoephedrine may result in increased alpha-adrenergic stimulation (excessive hypertension, bradycardia). Concurrent thyroid administration may ↓ effectiveness. May alter the effectiveness of insulin or oral hypoglycemics (dose adjustments may be necessary). May ↓ effectiveness of beta-adrenergic bronchodilators and theophylline. May ↓ beneficial beta-cardiovascular effects of diuretics or decongestants. Use cautiously within 4 days of MAO inhibitor therapy (may result in hypertension). Cimetidine may ↑ blood levels and toxicity. Concurrent NSAIDs may ↓ effectiveness of propranolol. May ↓ effectiveness of smoking cessation medications. Smoking may reduce the effectiveness of propranolol. May ↓ effectiveness of nitrates and 

Antihypertensive—
- PO: Initial dosing: May start 10–40 mg twice daily; may be repeated q 6–8 hr if needed. Up to 120 mg/day (up to 320 mg/day has been used). Dosing form is designed to be given once daily at bedtime. May increase to 20–80 mg/day in divided doses. See appropriate monograph for further information. Daily dose may vary from 20 to 320 mg/day. Avoid abrupt withdrawal of propranolol. May precipitate life-threatening arrhythmias, hypertension, or myocardial ischemia. Drug should be tapered over a 2 week period before discontinuation. Assess patient carefully during tapering and after medication is discontinued. Consider that patients taking propranolol for non-cardiac indications may have undiagnosed cardiac disease. Abrupt discontinuation or withdrawal over too-short a period of time (less than 9 days) should be avoided.

Toxicity and Overdose:
- May cause bradycardia, severe dizziness or fainting, severe drowsiness, dyspnea, rash, redistribution of body fluid, convulsions, fatigue, weight gain, jugular venous distention.
- May cause Stevens-Johnson syndrome. Discontinue therapy if severe or if accompanied with fever, general malaise, fatigue, muscle or joint aches, blistering, oral lesions, conjunctivitis, hepatitis and/or eosinophilia.

NURSING IMPLICATIONS

Assessment
- Monitor BP and pulse frequently during dose adjustment period and periodically during therapy.
- Abrupt withdrawal of propranolol may precipitate life-threatening arrhythmias, hypertension, or myocardial ischemia. Drug should be tapered over a 2-week period before discontinuation. Assess patient carefully during tapering and after medication is discontinued. Consider that patients taking propranolol for non-cardiac indications may have undiagnosed cardiac disease. Abrupt discontinuation or withdrawal over too-short a period of time (less than 9 days) should be avoided.

PO (Adults): Antihypertensive—80–320 mg/day in 2–4 divided doses or once daily as extended/sustained-release capsules. Antiprerenal—40 mg twice daily initially, may be ↑ as needed (usual range 120–240 mg/day, up to 1 g/day have been used); or 80 mg once daily as extended/sustained-release capsules. IV (Adults): Antihypertensive—20 mg 4 times daily; may be repeated q 6–8 hr if needed up to 120 mg as propranolol in 2 divided doses. Antiprerenal—80–320 mg/day in 2–4 divided doses or once daily as extended/sustained-release capsules. Antihypertensive—20–40 mg 3–4 times daily concurrently with alpha-adrenergic blocking therapy, started 3 days before surgery is planned. Concurrent blockade by propranolol—20–40 mg twice daily or 80 mg/day as extended/sustained-release capsules; may be ↑ as needed to 240 mg/day. IV (Adults): Antihypertensive—may be ↑ to 20–60 mg/day (up to 320 mg/day have been used).

PO (Children): Antihypertensive—1/4–1 mg/kg/day in 2–4 divided doses; may be ↑ as needed (usual range for maintenance dose is 2–4 mg/kg/day in 2 divided doses). Antiprerenal—may be repeated q 6–8 hr as needed.

PO (Adults): Antihypertensive—may be repeated q 12 hr after 2 mg oral and intra muscular. Antiprerenal—may be repeated q 6–8 hr after 2 mg intramuscular.

PO (Children): Antihypertensive—may be repeated q 6–8 hr after 2 mg oral and intra muscular. Antiprerenal—may be repeated q 6–8 hr after 2 mg intramuscular.

*This monograph does not cover all possible side effects and does not replace medical advice. Always consult your physician or pharmacist for medical advice.

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CONTINUED

propranolol

Multiple therapies (or policies, services). Notify all healthcare professionals immediately if these signs occur.

- Hypotension may be treated with modified Trendelenburg position and IV fluids unless contraindicated. Vasoconstrictors (epinephrine, norepinephrine, dopamine, dobutamine) may also be used. Hypotension does not respond to beta agonists.
- Thrombocytopenia has been noted in oral and IV propranolol.

Potential Nursing Diagnoses

- Decreased cardiac output (Side Effects)

Noncompliance (Patient/Family Teaching)

Decreased cardiac output (Side Effects)

Glucagon has been used to treat bradycardia and hypotension.

Implementation

- High Alert: IV vasoactive medications are inherently dangerous. Before administering
  intravenous therapy, have second practitioner independently check the original
  order, dose calculations, and infusion pump settings. Also, patient harm or fatali-
  ties have occurred when switching from oral to IV propranolol. Oral and paren-
  teral doses are not interchangeable. IV dose is 1/10 of the oral dose. Change to
  oral therapy as soon as possible. Do not confuse propranolol with pravachol.

- High Alert: Do not confuse Inderal (propranolol) with Adderall (an ampheta-
  mine/dextroamphetamine combination drug).

- PO: Take apical pulse prior to administering. If ≤50 bpm or if arrhyth-
  mia occurs, withhold medication and notify physician or other health
  care professionals.

- Administration with or without food is acceptable. Notify all health care
  professionals immediately if these signs occur.

Intermittent Infusion

- Diluent: Administer undiluted or dilute 1 mg in 30 mL of D5W
  for injection. Concentration: Unlabeled 1 mg/mL. Diluted in 10 mL of D5W

- Y-Site Compatibilities: amphotericin B complex with C, voriconazole, zoledronic acid.

- Y-Site Incompatibilities: amphotericin B cholesteryl, amphotericin B colloidal, amphotericin B lipid complex, amphotericin B liposome, dextranomers, dextranomers.

Preparation

- Volume: 10 mL

- Concentration: 1 mg/mL

- Rate: Administer at 0.5 mg/min for adults to avoid hypotension and
  cardiac arrest; do not exceed 3 mg/min.

- Intermittent Infusion: Diluent: May be diluted in 10 mL, 0.9% NaCl, D5W, D5W-4.5% NaCl, D5W-4.5% NaCl, or lactated Ringer’s injection. Concentration: Depends on dose. Rate: Administer over 10–15 min.

- Y-Site Compatibility: amphotericin B, amphotericin B colloidal, amphotericin B liposome, dextranomers.

- Y-Site Incompatibility: amphotericin B colloidal, amphotericin B liposome, dextranomers.

- Cautions: Drug Name: G - Genetic Implication. CPTORS indicate hi-frequency. underline indicates most frequent.

- Discontinued.
**Patient/Family Teaching**

- Instruct patient to take medication as directed, at the same time each day, even if feeling well; do not skip or double up on missed doses. Take missed doses as soon as possible up to 4 hr before next dose (8 hr with extended-release propranolol). Inform patient that abrupt withdrawal can cause life-threatening arrhythmias, hypertension, or myocardial ischemia.

- Advise patient to make sure enough medication is available for weekends, holidays, and vacations. A written prescription may be kept in wallet in case of emergency.

- Teach patient and family how to check pulse daily and BP biweekly. Advise patient to hold dose and contact health care professional if pulse is <50 bpm or BP changes significantly.

- May cause dizziness or dizziness: Caution patients to avoid driving or other activities that require alertness until response to the drug is known.

- Advise patients to change positions slowly to minimize orthostatic hypotension, especially during initiation of therapy or when dose is increased.

- Caution patient that drug may increase sensitivity to cold.

- Do not stop taking medication abruptly. Abrupt withdrawal can cause life-threatening arrhythmias, hypertension, or myocardial ischemia.

- Diabetic patients should closely monitor blood glucose, especially if weakness, malaise, confusion, or fatigue occurs. New onset of thirst, increased urination, or signs of hyperglycemia, but dizziness and sweating may also occur.

- Advise patient to notify health care professional of medication regimen prior to treatment or surgery.

- Adverse effects that may occur include dizziness, fatigue, hypoglycemia, orthostatic hypotension, bradycardia, chest pain, and angina. Monitor patient for these symptoms and refer to health care professional if they occur.

- Patients should be warned of the potential for rebound tachycardia after abrupt withdrawal of propranolol.

- Advise patient to carry identification describing disease process and medication regimen at all times.

- Hypertension: Reinforce the need to continue additional therapies for hypertension (weight loss, sodium restriction, stress reduction, regular exercise, moderation of alcohol consumption, and smoking cessation). Medication controls but does not cure hypertension.

- Angina: Caution patient to avoid overexertion and to take ERT as needed.

- Vascular Headache Prophylaxis: Caution patient that sharing this medication may be dangerous.

- PPD: Advise patient that medication may relieve distressing symptoms but that psychotherapy is the primary treatment for the disorder. Refer patient and family to a PPD support group.

**Evaluation/Desired Outcomes**

- Decrease in BP.

- Control of arrhythmias without appearance of detrimental side effects.

- Reduction in frequency of anginal attacks.

- Increase in activity tolerance.

- Prevention of MI.

- Prevention of vascular headaches.

- Management of hypertension.

- Management of phaeochromocytoma.

- Decrease in symptoms associated with PPD.

- Decrease in symptoms associated with PTSD.

**Why was this drug prescribed for your patient?**